Claims

1. (Currently amended) A method of producing radiance transfer coefficients for a set of points sampled over a modeled object for rendering images of the object on a computer, the method comprising:

creating an object positions texture representing positions of a set of points sampled over the object mapped into a texture space;

creating an object normals texture representing normals of the set of sampled points mapped into the texture space;

iteratively, for each of a set of directions sampled about the object,

rendering the object from the direction to produce a shadow buffer representing depth from the object in the direction for the set of points;

as a texture-based operation, determining cosine terms of the set of sampled points for the currently iterated direction based on the normals represented in the object normals texture and currently iterated direction;

as a texture-based operation, determining shadowing of the set of sampled points for the currently iterated direction based on the depths represented in the shadow buffer and positions represented in the object positions texture;

as a texture-based operation, determining radiance transfer contribution of the set of sampled points for the currently iterated direction based on the determined cosine terms and shadowing; and

accumulating the radiance transfer contributions of the set of sampled points for the currently iterated direction with that of previously iterated directions;

rendering an image of the object in a lighting environment based on the accumulated radiance transfer contributions; and

presenting the image.

2. (Original) A computer system for hardware-accelerated processing of a radiance transfer coefficients computation for a set of points sampled over a modeled object for use in rendering images of the object, the computer system comprising:

a memory for storing program code of at least one pixel shader and a radiance transfer coefficients processing program;

a central processing unit operating to execute the radiance transfer coefficients processing program;

a graphics processing unit programmable by and operating to execute the at least one pixel shader;

wherein the radiance transfer coefficients processing program executing on the central processing unit creates an object positions texture representing positions of a set of points sampled over the object mapped into a texture space, and creates an object normals texture representing normals of the set of sampled points mapped into the texture space;

wherein the at least one pixel shader executing on the graphics processing unit performs texture operations that iteratively, for each of a set of directions sampled about the object,

render the object from the direction to produce a shadow buffer representing depth from the object in the direction for the set of points;

determine cosine terms of the set of sampled points for the currently iterated direction based on the normals represented in the object normals texture and currently iterated direction;

determine shadowing of the set of sampled points for the currently iterated direction based on the depths represented in the shadow buffer and positions represented in the object positions texture;

determine radiance transfer contribution of the set of sampled points for the currently iterated direction based on the determined cosine terms and shadowing; and

accumulate the radiance transfer contributions of the set of sampled points for the currently iterated direction with that of previously iterated directions.

3. (Original) Computer-readable media having stored thereon programming code executable at least in part on graphics accelerating hardware on a computer to perform processing of a radiance transfer coefficients computation for a set of points sampled over a modeled object for use in rendering images of the object, the programming code comprising:

code means executable on a computer for creating an object positions texture representing positions of a set of points sampled over the object mapped into a texture space;

code means executable on a computer for creating an object normals texture representing normals of the set of sampled points mapped into the texture space;

code means executable on the graphics accelerating hardware of the computer to perform texture-based operations that iteratively, for each of a set of directions sampled about the object,

render the object from the direction to produce a shadow buffer representing depth from the object in the direction for the set of points;

determine cosine terms of the set of sampled points for the currently iterated direction based on the normals represented in the object normals texture and currently iterated direction;

determine shadowing of the set of sampled points for the currently iterated direction based on the depths represented in the shadow buffer and positions represented in the object positions texture;

determine radiance transfer contribution of the set of sampled points for the currently iterated direction based on the determined cosine terms and shadowing; and

accumulate the radiance transfer contributions of the set of sampled points for the currently iterated direction with that of previously iterated directions.

4. (New) The method of claim 1 wherein the texture-based operations for determining cosine terms, determining shadowing, determining radiance transfer contributions, and said accumulating radiance transfer contributions form an inner computational loop that iterates over the sampled points, and wherein an outer computational loop iteratively repeats the inner computational loop over the set of sampled directions.

5. (New) The computer system of claim 2 wherein the texture operations that render, determine cosine terms, determine shadowing, determine and accumulate radiance transfer contributions form an inner computational loop that iterates over the sampled points, and wherein an outer computational loop iteratively repeats the inner computational loop over the set of sampled directions.

6. (New) The method of claim 1 wherein the object positions texture contains an arrangement of data values representing the position of each of the sampled points mapped into the texture space.

7. (New) The method of claim 4 wherein the object positions texture is stored in an RGB component format.

8. (New) The method of claim 1 wherein the object normals texture contains an arrangement of data values representing the surface normal at each of the sampled points mapped into the texture space.

9. (New) The method of claim 1 wherein the set of directions are generated as uniformly distributed points on a unit sphere based on a mapping from the unit square to the sphere and jittered sampling.

10. (New) The method of claim 1 wherein said determining cosine terms, determining shadowing, determining radiance transfer contribution, and accumulating the radiance transfer contributions are performed using a pixel shader executed on a programmable graphics processing unit.

11. (New) The method of claim 1 wherein said rendering the object from the direction comprises rendering the object as an orthographic camera projection whose view direction is set to the current direction.

12. (New) The method of claim 11 wherein said determining shadowing comprises for each of the sampled points:

computing depth of a current sampled point based on the current sampled point's position as represented in the object positions texture;

comparing the computed depth of the current sampled point to an object depth from the current direction as represented in the shadow buffer to determine visibility of the current sampled point in the current direction.

13. (New) The computer system of claim 2 wherein the object positions texture contains an arrangement of data values representing the position of each of the sampled points mapped into the texture space.

14. (New) The computer system of claim 2 wherein the object positions texture is stored in a floating point number format.

15. (New) The computer system of claim 2 wherein the object normals texture contains an arrangement of data values representing the surface normal at each of the sampled points mapped into the texture space.

16. (New) The computer system of claim 2 wherein the set of directions are to uniformly distributed points on a unit sphere.

17. (New) The computer system of claim 2 wherein said rendering the object from the direction comprises rendering the object as an orthographic camera projection whose view direction is set to the current direction.

18. (New) The computer system of claim 17 wherein said determining shadowing comprises for each of the sampled points:

computing depth of a current sampled point based on the current sampled point's position as represented in the object positions texture;

comparing the computed depth of the current sampled point to an object depth from the current direction as represented in the shadow buffer to determine visibility of the current sampled point in the current direction.

19. (New) The computer-readable media of claim 3 wherein said code means executable on the graphics accelerating hardware of the computer to perform texture-based operations is a pixel shader executable on a programmable graphics processing unit.

20. (New) The computer-readable media of claim 3 wherein said code means executable on the graphics accelerating hardware comprises: an inner computational loop that iterates over the sampled points as the texture operations that determine cosine terms, determine shadowing, determine and accumulate radiance transfer contributions form an inner computational loop; and an outer computational loop that iterates the inner computational loop over the set of sampled directions.